Docket No. 2003-005-DSK

# SNAP-IN SLOT MOUNT RFI/EMI CLIPS

## CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of the filing date of corresponding U.S. Provisional Patent Application No. 60/449,946, entitled SNAP-IN SLOT MOUNT RFI/EMI CLIPS, filed February 25, 2003.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention:

The present invention relates generally to an electromagnetic interference (EMI)/radio frequency (RF) interference shielding gasket for use in suppressing undesired electromagnetic emissions. In particular, the present invention relates to an improved shielding gasket for reducing the amount of force required during the mounting process.

### 2. Background of the Invention:

Electromagnetic interference (EMI) refers to an electromagnetic disturbance that may potentially impede or degrade the reception of authorized electronic emissions. Undesirable electromagnetic fields leaked from an electronic device may disrupt the operation of other electronic devices in a localized area. Although the metallic housing of the electronic device acts as a shield to contain electromagnetic signals, electromagnetic emissions may still pass through air gaps

in the metallic enclosure seams. For example, enclosure seams, such as doors, panels, and other connected interfaces of a modular enclosure, may contain small gaps between modules. If an air gap exists in the seam, the flow of electromagnetic energy will be diverted to those connected interfaces and pass through the seam.

In order to contain or suppress undesired radiated emissions in modular enclosures, shielding gaskets are typically used to maintain a conductive pathway across enclosure members. For example, **Figure 1** depicts a known system **100** including EMI slot mount gasket **102**. EMI gasket **102** comprises a plurality of ribs or clips, such as clips **104** and **106**. Clips **104** and **106** act as latching mechanisms, and allow EMI gasket **102** to be mounted on flange **108** in a snap-on manner and hold EMI gasket **102** in place. Flange **108** may be located on a receiving device, such as a chassis member or a modular component. **Figure 1** illustrates how EMI gasket **102** may be mounted in slots of flange **108** and compressed between another chassis member or module **110** to effectively create a conductive pathway between the members.

EMI gaskets in effect seal the air gaps between mating modules or chassis members. With higher data rates exceeding frequencies of 1 gigahertz, the number of shielding gaskets used must be increased to reduce the size of apertures that might leak undesired EMI energy. Consequently, the application and installation of this increased number of shielding gaskets in a manufacturing environment becomes tedious and time consuming. Due to the difficulty in inserting the gaskets in their

respective mounting holes or slots, the shielding gaskets may not be mounted correctly in many instances. Furthermore, slot mount gaskets may become damaged because of excess manipulation caused by the handlers in their attempts to position the gaskets by applying pressure to mount the ribs or clips into their respective slots. This excess manipulation may cause physical problems of employee thumbs and fingers, as well as cause failures in testing for radiated emissions if the gaskets are not mounted correctly. Excess handling of the gasket due to re-fitting may have corrosive effects that may deteriorate the conductivity of the material/plating surface over time (e.g., salt from fingertips if gloves are not worn). The corrosive effects may lead to early failure of the gasket joints, as well as causing the gasket to fall out of compliance with applicable agency regulations.

Therefore, it would be advantageous to have an EMI suppression mechanism that includes a lead-in to reduce the amount of force required of the assembler during the mounting process, thereby providing for easier assembly during rework or product upgrades.

## SUMMARY OF THE INVENTION

The present invention provides an improved shielding gasket for reducing the amount of force required during the mounting process. The present invention solves the problems present in the prior art by modifying existing EMI gaskets to include an extended lip on the ribs or clips of the gaskets. This extended lip is added to the ribs or clips to facilitate the EMI gasket installation process. The ramp feature is implemented in the present invention to function as a lead-in, such that less force is required by the assembler when mounting the EMI gasket onto a module or chassis member. In this manner, the installation process may be improved, since an assembler may spend less time manipulating the gasket in an attempt to position and mount the clips into their respective slots on the module or chassis.

## BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

**Figure 1** depicts a known system including a slot mount electromagnetic interference (EMI) gasket;

**Figure 2** depicts a bottom view of an exemplary EMI gasket in accordance with a preferred embodiment of the present invention;

**Figure 3** depicts a bottom view of an exemplary EMI gasket in accordance with an alternative embodiment of the present invention;

**Figure 4** depicts a side view of an exemplary EMI gasket in accordance with a preferred embodiment of the present invention;

**Figure 5** depicts a pictorial diagram of an example application of EMI gaskets, described in **Figures 2**, **3**, and **4**, utilizing a storage array; and

**Figure 6** depicts a pictorial diagram of an example application of EMI gaskets, described in **Figures 2**, **3**, and **4**, wherein the EMI gaskets are mounted to seal the gap between modules in the storage array.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the figures, **Figure 2** shows a bottom view of an exemplary electromagnetic interference (EMI) gasket in accordance with a preferred embodiment of the present invention. EMI gasket **200** has an arched configuration and may comprise a plurality of first and second ribs or clips, such as first clip row **202** and second clip row **204**. Each rib or clip in first clip row **202** corresponds to a rib or clip in second clip row **204**. First clip row **202** may be positioned directly opposing second clip row **204**. First and second clip rows **202** and **204** extend beyond opposite sides of the main portion of EMI gasket **200** and curve back inward under themselves in a rib-like manner.

Clips are desirable for their ease of installation when there is an accessible mounting flange. EMI gasket **200** may be mounted by first placing a row of ribs or clips, such as first clip row **202**, into slots on the receiving device, such as a module or chassis member. Alternatively, in an edge mount system, first clip row **202** may be placed over the edges of the flange. Pressure may then be applied to EMI gasket **200** to snap each clip of second clip row **204** into their respective slots on the receiving device.

In particular, EMI gasket **200** comprises a modified row of ribs or clips in accordance with a preferred embodiment of the present invention. The present invention improves upon known EMI gaskets by modifying the clips to include extended lip **206** at the end of the

clips, as shown by modified second clip row **204**. The addition of extended lip **206** to form modified second clip row **204** reduces the amount of force required to mount EMI gasket **200**.

When EMI gasket **200** is placed over the module or chassis member, a first row of clips, such as first clip row **202**, are mounted into slots on the module or chassis. At this point, the second row of clips needs to be installed in their respective slots on the module or chassis member. As pressure is applied to EMI gasket **200** to install the second row of clips, extended lip **206** of second clip row **204** provides a lead-in, such that the force needed to slip each modified clip in second clip row **204** into its respective slot is less than if the clips in second clip row **204** did not include extended lip **206**.

Although two different ribs or clips are used for EMI gasket **200** as shown in **Figure 2**, one having a known rib or clip structure (i.e., first clip row **202**) and the other employing the lip addition of the present invention (i.e., second clip row **204**), it should be noted that it is also possible to utilize the lip addition on both rows of ribs or clips, as shown in **Figure 3**. **Figure 3** depicts another embodiment of the present invention having the lip addition on both rows of ribs or clips for EMI gasket **300**, such that all of the ribs or clips for EMI gasket **300** will include the lip addition to further facilitate the installation of EMI gasket **300** onto a receiving device. **Figure 3** also illustrates that the shape of the lip addition may vary. Thus, one of ordinary skill in

the art would understand that the present invention includes, but is not limited to, the lip addition configurations listed above.

Turning now to **Figure 4**, a side view of an exemplary EMI gasket, described in **Figure 2**, is depicted in accordance with a preferred embodiment of the present invention. EMI gasket **400** is placed on mounting flange **404** of a receiving device, such as a module or chassis member. When clip **402** is inserted into a slot in flange **404**, pressure may be applied to EMI gasket **400** to mount modified clip **406** with extended lip **408** into a second slot of flange **404**. In this manner, less force is required to insert each clip into each slot of flange **404**. Consequently, the time it takes to install EMI gasket **400** may be reduced, thereby decreasing assembly time and increasing productivity.

Furthermore, the addition of extended lip **408** to the clips may decrease the rework of improperly assembled or damaged gaskets. Installation of these gaskets has become time consuming, since it can be difficult to insert the clips into their respective mounting slots. Due to the difficulty, the gaskets are not mounted properly in some cases. Excess manipulation of the gaskets to properly position the gaskets and mount the clips may also result in damage to the gaskets. Since the lip additions to the clips allow an assembler to use less force to insert the clips into their respective slot, an assembler may more easily install a gasket onto a receiving device. By providing a mechanism that allows an assembler to more easily install the gasket, the

gaskets are more likely to be installed correctly since the difficulty of inserting the clips into their respective slots is decreased. As a result, the need to rework improperly assembled or damaged gaskets is reduced.

In addition, the impact on the physical health of the assembler during manufacturing may also be lessened. By providing a mechanism that allows an assembler to more easily install the gasket, the toll on the fingers and thumbs of the assembler may be decreased. Thus, the present invention allows for reduce health problems and subsequent insurance claims of assemblers during the manufacturing process.

Turning now to **Figure 5**, a pictorial diagram of an example application of EMI gaskets, described in **Figures 2**, **3**, and **4**, is depicted utilizing a storage array. Storage array **500** comprises several drive bays which are mounted in frame **502** and located at one end of storage array **500**. The drive bays are used to mount disk array modules, such as disk array modules **504**, **506**, **508**, and **510**, each of which contains a plurality of high-density disks. Other items may also be included within storage array **500**, such as a power supply, fan assembly, high performance engine and microprocessor. Frame **502** may be any general support structure for mounting the components of the storage array in an operative relationship.

Storage array controller electronics may be mounted into frame **502** to provide intelligence to storage array **500**. A disk array module, such as disk array module **504**, may be inserted into a drive bay, and removed from the

drive bay by using an ejection mechanism, such as eject lever **512** on disk array module **504**.

Turning now to **Figure 6**, a pictorial diagram of an example application of EMI gaskets, described in **Figures 2**, **3**, and **4**, is shown, wherein the EMI gaskets are mounted on the disk array modules to seal the gap between modules in the storage array. Storage array **600** is shown to have two disk modules **602** and **604** inserted into drive bays within storage array **600**. Disk modules **606** and **608** are shown to have EMI gaskets **610**, such as EMI gasket **400** shown in **Figure 4**, installed on the modules. When disk module **606** is inserted into a drive bay, such as drive bay **612**, the EMI gaskets fill the gaps between the modules, thereby providing an electrical connection to create an isolating electromagnetic cage around the radiating components within storage array **600**. Consequently, the EMI gaskets reduce EMI problems by reducing air gaps or gaps of high resistance which provide pathways for electromagnetic leakage.

It should also be noted that the present invention may be used in any number of devices, and is not limited to the devices described above. The present invention may be utilized to provide EMI shielding for any type of device that produces electromagnetic interference and is capable of being implemented in a suitable module or chassis member.

Thus, the present invention provides an EMI suppression mechanism having a lead-in feature added to the rib or clip members of the EMI gasket. The mechanism of the present invention reduces the amount of force

required of the assembler during the mounting process, thereby providing for easier assembly during rework or product upgrades. The present invention provides an advantage over known shielding gaskets by facilitating the installation process, wherein an assembler may use less force to insert a rib or clip into its respective slot. Consequently, the difficulty in mounting an EMI gasket in accordance with the present invention is reduced, as well as the damage to the gaskets from excess manipulation caused by the assemblers in their attempts to position the gaskets and applying pressure to force the ribs or clips into their slots. Physical problems of assembler thumbs and fingers may be reduced, as well as EMI failures caused by improperly mounted gaskets. The present invention may also reduce the corrosive effects caused by excess handling of the gasket due to re-fitting. The corrosive effects may deteriorate the conductivity of the material/plating surface over time and lead to early failure of the gasket joints, as well as causing the gasket to fall out of compliance with applicable agency regulations. Thus, by reducing the amount of force required to install the EMI gasket, the present invention may increase productivity by decreasing assembly time, decrease rework of improperly assembled or damaged gaskets, reduce the corrosive effects caused by excess handling, and reduce health risks and subsequent insurance claims of assemblers during manufacturing.

The description of the present invention has been presented for purposes of illustration and description, and is not intended to be exhaustive or limited to the

invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.